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ABSTRACT

This research report, applying an interdependency approach in an input-output framework to school district budgeting, presents a model aimed at the district management level. The data cover the 1967 operating budget of the Centralia, California, School District of approximately 3.9 million population. Three tables with accompanying textual material are used to construct an intersector (input-output) tabulation for the school system model -- an interdependency table (identity matrix), a direct coefficiency matrix, and a direct and indirect coefficiency matrix. The report concludes that this approach applies to those classes of educational activities where interdependencies are important. (JF)

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APPLICATION OF LEONTIEF INPUT-OUTPUT ANALYSIS TO SCHOOL DISTRICT BUDGETING*

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In this study, we were concerned with the application to education of models which portray interdependent activities. Models of necessarily interdependent productive activities have a long history in economics. Just short of two centuries ago Francois Quesnay, physician, intimate of Mirabeau, and tutor of Turgot, published his "Tableau Economique," in which the motive of the compartmentalized treatment of necessarily interdependent productive activities was perhaps first formally advanced. These ideas influenced Adam Smith, whose own great work was published in 1776, two years after Quesnay's death, but then lay dormant for about a century. At this time another French economist, Leon Walras, employed a somewhat similar approach in his highly abstract and detailed examination of the conditions for economic equilibrium. Finally, in our own generation Wassily Leontief, of Harvard University, had the insight to recognize in these ideas not simply a tool for the theoretician but a practical instrument for attacking some of the most complex and perplexing real problems of our modern industrial economic environment.[1]

The work of Leontief, familiarized as "input-output analysis," has spread over the world and is now part of national sta-

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[1] Leontief, Wassily W. The Structure of American Economy, 1919-1929, Harvard University Press, Cambridge, Mass., 1941. Reissued in an enlarged edition as The Structure of the American Economy, 1919-1939. Also see, W. Duane Evans and Marvin Hoffenberg, "The Interindustry Relations Study for 1947," The Review of Economics and Statistics, volume XXXIV, Number 2, May, 1952.

tistical systems or planning tools in approximately 60 countries in the world. Centrally planned economies have "legitimatized" Leontief's work and input-output is taught and used in such countries. In order to eliminate some of the constraints in classical input-output models other programming techniques such as linear programming have been developed.

But models of necessarily interdependent activities in an input-output framework are applicable outside economic and industrial activities.

There have been continuing applications in demography for educational planning, for the individual firm, and for sub-national economic units such as cities, counties, and regions. We are endeavoring to investigate the worth and feasibility of applying such a framework to a school district for planning, programming, and budgeting purposes.

A formulation for interdependency

The basic notion underlying the interdependency approach is to regard the domain of application, a school district here, as made up of a relatively large number of identifiable activities, and then to establish and bring within the framework of analysis, the structural interrelationship among these sections.

The idea may be stated more rigorously as follows: A school district is regarded as being composed of (n+1) activities. For n of these it is assumed that the structural interconnections can be established. The remaining sector is the autonomous sector and represents the final product of all

activity. (That is, it represents the product of educational activity as it leaves the system and in the form consumed by the user). Some of this activity may flow to the autonomous sector; other amounts may go to any of the remaining programs or activities. (These intermediate flows--non final product--are required by such programs or activities as inputs into their own productive processes and are transformed before entering final products).

It is now assumed, and the assumption is critical, that the amount of production delivered by one activity or program to another non-autonomous program or activity will be exclusively a function of total activity in the later sector. Loose restrictions may be placed on the form of the interrelation functions--that they be nondecreasing (an activity requires at least as much of every input when its activity is increasing) and single-valued (for obvious reasons).

Under a set of very general conditions, given any desired set of final products and the structural interrelationships embodied in the stated functions, the corresponding minimum set of total activity levels can be computed. Accepting this formulation, it becomes a question of empirical investigation to identify the functions connecting the educational activities and programs.

The School Model

The model presented here is aimed at the level of school district management. This decision was forced upon us, at this

stage of methodological development, by data availability. Immediately, two problems arose, first, the perennial plague of gross aggregations, and second, the necessity to link macro- and micro-models in a meaningful way. We will only touch on these problems here and now.

The data are for the current operations of the Centralia, California School District for 1967. The Centralia District is in Orange County and is near Los Angeles. (Orange County is a separate Standard Metropolitan Statistical Area contiguous to the Los Angeles-Long Beach SMSA).

The operating budget covered was approximately $3.9 million. The basic data used were aggregated and processed by Donald Wickert for his doctoral dissertation and was organized for a different purpose than ours.[2]

The Inter-Program Flow Matrices

Regardless of the form of the school system model to be constructed, an inter-sector (input-output) tabulation for the system for some recent period of time is virtually a necessary prerequisite. There are several reasons for this. The data used in the system cost model of interdependent activities purport to be the facts needed to make the model work. The principal problems in the collection and use of such data are succinct-

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[2] Wickert, Donald M. Allocating Financial Resources Using Legal Programs Decriptions, unpublished dissertation for Ed., Graduate School of Education, University of California, Los Angeles, 1968.

ly summarized as those of educational design and those of statistical design. The problem of educational design deals with what we want to know about the educational system and how we go about amassing the facts. Involved here is a paradigm of educational processes, what is important to delineate, and what relationships may be sought. The problem of statistical design deals with ways of ascertaining and restricting errors of observation.

As presented in Table 1, the input-output table for the Centralia School District (1967) is in conventional Leontief input-output form. Reading across the table, the entries represent the supporting activities to the non-autonomous sectors. On the right side (Column 33), sales to the final users, the autonomous sector, is recorded. This sector, the final product of the school system, is equal to the operating budget on the commodity output side.

Each column of the table shows the costs or inputs needed to support the level of activity of the specified program in the specific year. Reading down, the figures first show the applied expenditures, purchases from other programs or activities. Towards the bottom (row 33), direct payments--wages and salaries to certified and classified personnel, supplies and materials, equipment, furniture and apparatus, and miscellaneous expenditures--are recorded. These are the value added by the program, its net output, and is equal to the value of total activity minus the value of intermediate support from other programs

in the school system. The sum of direct payments, the value added, is equal to the value of the final product and to the operating budget. This is simply an accounting identity; the sum of payments to factors of production, (the sum of value added in each activity), eliminates double counting and is equal to the value of final product.

Table 1 is essentially a system of double entry bookkeeping which shows for a given domain at a given period the inputs and outputs for the separately determined activities. The form of the accounts--the table--is square here with as many rows as columns. There is no unique way for ordering the activities. The matrix is in triangular form for ease in computation but could be ordered in other ways. The flows are expressed in dollars, a common numéraire for all activities. It does have, however, another definition for use of the table, namely, the amount of "real output" purchased for a dollar with 1967 purchasing power. This definition is carried over to uses of the table for other than the base year.

In many instances, especially for relatively small changes in activity levels, a proportionality assumption may be used (see Table 2). In such cases the base year flow table, such as Table 1, takes on an enhanced importance. This proportionality assumption is commonplace in applications of the Leontief input-output system and the coefficient data obtained from it for other programming models.

The direct coefficient matrix: Table 2

This table of coefficients was calculated directly from Table 1, by dividing each column vector (excluding the direct payment cell) by the appropriate value of output shown in column 34. For example, the coefficient in column 1, row 34, was obtained by dividing $8,999, the flow from Library to Kindergarten, by $234,999, the value of Kindergarten output recorded in column 34.

Table 2 may be interpreted as indicating in simple form the unit input structure for each activity or program in the school district for the base year in terms of its purchases from other processing sectors. In the second column for example, each dollar of output of G 1-3 Regular required $.0144 of output from English as a Second Language (11); $.098 output from Remedial Reading, and so on. The sum of the coefficients for any sector is equal to $1.000 minus the direct payments coefficient (33) not shown in the table. The coefficients were computed only for the processing sectors.

Table 1 is simply a description of the defined system during a given time period. The use of Table 2 implies a theory of how the system works. The equation system of Table 2 can now be brought to bear on one of the more conventional uses of an input-output model, namely, what would be the effect of changes in the volume of each activity or program defined in the educational system. Volume is specified since we are manipulating outputs always expressed in base year prices (see

above). This means that the stipulated levels of autonomous demands must be expressed in base year values.

The direct and indirect coefficient matrix.

Table 3 is based on figures from Table 1 but is computed more directly from Table 2. It is of special interest since it shows the combined direct and indirect requirements placed on all sectors by the delivery outside the processing system of $1 of final product from each sector. For example, Kindergarten (sector 1) directly required approximately 9 cents of output from Administration (sector 32) (see Table 2). In addition to this requirement, approximately another 3 cents of output (see Table 3) was indirectly required to sustain the output of the Kindergarten by Kindergarten through the other programmatic outputs it required.

Each row in Table 3 shows the output required directly and indirectly from each sector to support the delivery outside the processing system of one dollar by the activity names at the head of the column vector. Technically, Table 3 is the inverse of the difference between an identity matrix and the coefficient matrix (Table 2).

Uses for the Model

To this point we have spoken of and described a system of interprogram or interactivity relations or a model of general interdependency. Essentially this is a general approach to problems rather than a single method or technique. As an approach,

it includes different methods, as, for example the class of programming methods of which the input-output model is one. The basic philosophy of the approach outlined here may be expressed as follows: The answers to many problems of choice for an educational system cannot be found in any formal manipulation involving simply activity or program outputs, or even inputs. Hence, one must begin by examining the quantitative details relating to specific activities of the system, find the elements of stability in their interconnections, and devise methods for applying the results to educational system problems. In systems analysis terminology, the objective is to establish and apply the chosen operational constants of the educational system.

The basic data in the form presented in Table 1 is, by itself, useful for a number of purposes. From the conceptual point of view, the idea of interrelationships and the ability to begin to empirically fill the empty boxes of theory is a start towards creating a new, and we think fruitful, informational environment for thinking about, and attacking systems problems. Currently, data used in educational research tend to be by-products of administrative, regulatory or executive functions in the educational system. In addition to these primary data collections systems there are, as in this paper, synthetic data which are manipulations of various primary data series or special studies. With the beginnings--only beginnings we must add--of viewing the administration of school systems as one of managing and controlling large, exceedingly complex, probabilistic systems,

new data specifications are needed. The type of interdependency tables of the form of Table 1 is a useful way of specifying the types of outputs needed from a basic information system for a broad class of school decision, if we are truly serious about school use of new "management technologies".

Some Concluding Remarks

Do we have something here or are we just enamoured with matrix algebra? In part the answer turns on the degree of interdependency in the educational system. The formulation of a school district's activities at the primary school level does indicate some. Would a different formulation eliminate it? We doubt it. Since the purpose of this paper is more towards methodological questions than application, we present our approach as one for those classes of educational activities where interdependencies are important. We have indicated examples in this class.

APPLICATION OF LEONTIEF INPUT-OUTPUT ANALYSIS
TO SCHOOL DISTRICT BUDGETING

TABLE 1 - 3

TABLE 1 - INTERPROGRAM FLOWS BY PROGRAM OF ORIGIN AND DESTINATION: CENTRALIA (CALIFORNIA) SCHOOL DISTRICT, 1967*

		1**	2	3	4
1	Kindergarten	--	--	--	--
2	G 1-3; Regular Pupils	--	--	--	--
3	G 1-3; Physically Handicapped Pupils	--	--	--	--
4	G 1-3; Educationally Handicapped Pupils	--	--	--	--
5	G 4-6; Regular Pupils	--	--	--	--
6	G 4-6; Physically Handicapped Pupils	--	--	--	--
7	G 4-6; Educationally Handicapped Pupils	--	--	--	--
8	Education for Mentally Retarded Pupils	--	--	--	--
9	Community Activities	--	--	--	--
10	Instrumental Music	--	--	--	--
11	English As a Second Language	--	24,840	--	--
12	Learning Enrichment	--	5,944	--	--
13	Remedial Reading	--	168,980	--	--
14	Mentally Gifted	--	7,902	--	--
15	Learning Disability	--	17,990	--	--
16	Remedial Speech	--	25,631	--	--
17	Home Bound Pupils	--	2,170	--	--
18	Summer School; Regular Pupils	--	47,207	--	--
19	Summer School; Physically Handicapped	--	--	3,080	--
20	Summer School; Mentally Retarded Pupils	--	--	--	--
21	Summer School; Educationally Handicapped	--	--	--	1,187
22	Summer School; English As a Sec. Language	--	984	--	--
23	Summer School; Remedial Speech	--	596	1,348	--
24	Lunch	--	93,506	--	626
25	Guidance and Mental Health	--	--	--	3,512
26	Library	8,999	27,267	393	175
27	Pupil Health	7,006	21,224	306	136
28	Transportation	5,723	17,336	26,443	3,427
29	General Curriculum	20,882	128,977	5,528	2,456
30	Maintenance	7,534	37,225	1,595	709
31	Custodial and Other Operations	21,029	103,912	4,453	1,979
32	Administration	20,771	128,291	6,484	2,786
33	Direct Payments	142,505	866,679	43,876	19,335
34	Total Outlays	234,499	1,727,181	93,506	36,328

*Each row shows output of producing program named at left. Each column shows input distribution for purchasing program named at top. All figures in dollars. Based on data in Wickert, Donald M., Allocating Financial Resources Using Legal Program Descriptions, unpublished Doctoral Dissertation, School of Education, University of California, Los Angeles, 1968.

**Columns have the titles of rows of the same number.

TABLE 1

	5	6	7	8	9	10	11	12
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	34,188	--	--	--	--	--	--	--
11	24,840	--	--	--	--	--	--	--
12	11,887	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	7,902	--	--	--	--	--	--	--
15	35,582	--	--	--	--	--	--	--
16	12,815	--	--	--	--	--	--	--
17	2,170	--	--	--	--	--	--	--
18	47,207	--	--	--	--	--	--	--
19	--	1,540	--	--	--	--	--	--
20	--	--	--	1,065	--	--	--	--
21	--	--	2,375	--	--	--	--	--
22	985	--	--	--	--	--	--	--
23	297	--	--	--	--	--	--	--
24	97,401	450	1,199	899	--	--	--	--
25	--	--	7,024	5,268	--	--	--	--
26	28,403	131	350	--	--	--	--	--
27	22,108	102	272	209	--	--	--	--
28	18,058	8,811	6,852	8,811	--	--	5,139	2,202
29	125,290	1,843	4,912	2,456	--	2,456	3,685	1,228
30	36,161	532	1,418	709	19,306	709	532	178
31	100,944	1,484	3,958	1,979	53,137	1,979	1,484	495
32	124,625	2,161	5,571	4,302	683	3,657	4,980	1,587
33	853,154	14,584	38,871	29,630	4,526	25,387	33,860	12,141
34	1,584,017	31,838	31,638	55,323	77,646	34,188	49,680	17,831

TABLE 1

	13	14	15	16	17	18	19	20
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	--	15,804	12,291	--	--	--	--	--
26	2,622	--	--	--	--	3,303	35	--
27	--	--	--	--	--	2,571	28	10
28	--	--	2,937	--	--	--	--	--
29	18,425	--	3,685	3,685	1,228	14,445	344	173
30	--	--	166	166	--	4,060	193	49
31	--	--	464	464	--	11,335	540	135
32	19,550	--	4,202	4,453	412	17,515	458	91
33	128,383	--	29,627	29,678	2,700	51,185	3,022	607
34	168,980	15,804	53,372	38,446	4,340	94,414	4,620	1,065

TABLE 1

	21	22	23	24	25	26	27	28
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	35	--	--	--	--	--	--	--
27	28	--	--	--	--	--	--	--
28	--	206	--	--	--	--	--	--
29	344	173	173	--	--	--	--	--
30	97	49	--	18,834	--	1,006	630	2,622
31	270	135	22	54,575	--	2,811	1,758	7,323
32	366	184	91	16,319	5,622	3,970	6,538	10,720
33	2,422	1,222	607	107,737	38,237	63,926	45,069	85,280
34	3,562	1,969	893	195,465	43,899	71,713	53,995	105,945

TABLE 1

	29	30	31	32	33	34
1	--	--	--	--	234,449	234,449
2	--	--	--	--	1,727,181	1,727,181
3	--	--	--	--	93,506	93,506
4	--	--	--	--	36,328	36,328
5	--	--	--	--	1,584,017	1,584,017
6	--	--	--	--	31,638	31,638
7	--	--	--	--	72,802	72,802
8	--	--	--	--	55,323	55,323
9	--	--	--	--	77,646	77,646
10	--	--	--	--	--	34,188
11	--	--	--	--	--	49,680
12	--	--	--	--	--	17,831
13	--	--	--	--	--	168,980
14	--	--	--	--	--	15,804
15	--	--	--	--	--	53,372
16	--	--	--	--	--	38,446
17	--	--	--	--	--	4,340
18	--	--	--	--	--	94,414
19	--	--	--	--	--	4,620
20	--	--	--	--	--	1,065
21	--	--	--	--	--	3,562
22	--	--	--	--	--	1,969
23	--	--	--	--	--	893
24	--	--	--	--	--	195,429
25	--	--	--	--	--	43,899
26	--	--	--	--	--	71,713
27	--	--	--	--	--	53,995
28	--	--	--	--	--	105,945
29	--	--	--	--	--	342,388
30	--	--	--	--	--	134,480
31	--	--	--	--	--	374,665
32	38,990	11,170	37,057	2,189	--	475,835
33	303,398	123,310	337,608	473,646	263	3,912,883
34	342,388	134,480	374,665	475,835	3,912,883	6,203,029

TABLE 2 - DIRECT PURCHASES PER DOLLAR OF OUTPUT, 1967*

	PROGRAM	1**	2	3	4
1	Kindergarten	--	--	--	--
2	G 1-3; Regular Pupils	--	--	--	--
3	G 1-3; Physically Handicapped Pupils	--	--	--	--
4	G 1-3; Educationally Handicapped Pupils	--	--	--	--
5	G 4-6; Regular Pupils	--	--	--	--
6	G 4-6; Physically Handicapped Pupils	--	--	--	--
7	G 4-6; Educationally Handicapped Pupils	--	--	--	--
8	Education for Mentally Retarded Pupils	--	--	--	--
9	Community Activities	--	--	--	--
10	Instrumental Music	--	--	--	--
11	English as a Second Lanugage	--	.01438	--	--
12	Learning Enrichment	--	.00344	--	--
13	Remedial Reading	--	.09784	--	--
14	Mentally Gifted	--	.00458	--	--
15	Learning Disability	--	.01042	--	--
16	Remedial Speech	--	.01484	--	--
17	Home Bound Pupils	--	.00126	--	--
18	Summer School; Regular Pupils	--	.02733	--	--
19	Summer School; Physically Handicapped	--	--	.03294	--
20	Summer School; Mentally Retarded Pupils	--	--	--	--
21	Summer School; Educationally Handicapped	--	--	--	.03267
22	Summer School; English as a Sec. Lanugage	--	.00057	--	--
23	Summer School; Remedial Speech	--	.00035	--	--
24	Lunch	--	.05414	.01442	.01723
25	Guidance and Mental Health	--	--	--	.09667
26	Library	.03838	.01579	.00420	.00482
27	Pupil Health	.02988	.01229	.00327	.00374
28	Transportation	.02441	.01004	.28279	.09433
29	General Curriculum	.08905	.07467	.05912	.06761
30	Maintenance	.03213	.02155	.01706	.01952
31	Custodial and Other Operations	.08968	.06016	.04762	.05448
32	Administration	.08858	.07428	.06934	.07669

*Each entry shows direct purchases from program named at left by program named at top per dollar of output by latter. Source: Data are based on Table 1.

**Columns have the titles of rows of the same number.

TABLE 2 (CON'T.)

	5	6	7	8	9	10	11	12
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	.02158	--	--	--	--	--	--	--
11	.01568	--	--	--	--	--	--	--
12	.00750	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	.00499	--	--	--	--	--	--	--
15	.02246	--	--	--	--	--	--	--
16	.00809	--	--	--	--	--	--	--
17	.00137	--	--	--	--	--	--	--
18	.02980	--	--	--	--	--	--	--
19	--	.04868	--	--	--	--	--	--
20	--	--	--	.01925	--	--	--	--
21	--	--	.03262	--	--	--	--	--
22	.00062	--	--	--	--	--	--	--
23	.00019	--	--	--	--	--	--	--
24	.06149	.01422	.01647	.01625	--	--	--	--
25	--	--	.09648	.09522	--	--	--	--
26	.01793	.00414	.00481	--	--	--	--	--
27	.01396	.00322	.00374	.00369	--	--	--	--
28	.01140	.27849	.09412	.15926	--	--	.10344	.12349
29	.07910	.05825	.06747	.04439	--	.07184	.07417	.06887
30	.02283	.01682	.01948	.01282	.24864	.02074	.01071	.00998
31	.06373	.04691	.05437	.03577	.68435	.05789	.02987	.02776
32	.07868	.06830	.07652	.07776	.00880	.10697	.10024	.08900

TABLE 2 (CON'T.)

	13	14	15	16	17	18	19	20
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	--	1.00000	.23029	--	--	--	--	--
26	.01552	--	--	--	--	.03498	.00758	--
27	--	--	--	--	--	.02723	.00606	.00939
28	--	--	.05503	--	--	--	--	--
29	.10904	--	.06904	.09585	.28295	.15300	.07446	.16244
30	--	--	.00311	.00432	--	.04300	.04177	.04601
31	--	--	.00869	.01207	--	.12006	.11688	.12676
32	.11569	--	.07873	.11582	.09493	.07960	.09913	.08545

TABLE 2 (CON'T.)

	21	22	23	24	25	26	27	28
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	.00983	--	--	--	--	--	--	--
27	.00786	--	--	--	--	--	--	--
28	--	.10462	--	--	--	--	--	--
29	.09657	.08786	.19373	--	--	--	--	--
30	.02723	.02489	--	.09635	--	.01403	.01167	.02475
31	.07580	.06856	.02464	.26897	--	.03920	.03256	.06912
32	.10275	.09345	.10190	.08349	.12898	.05536	.12109	.10124

TABLE 2 (CON'T.)

	29	30	31	32
1	--	--	--	--
2	--	--	--	--
3	--	--	--	--
4	--	--	--	--
5	--	--	--	--
6	--	--	--	--
7	--	--	--	--
8	--	--	--	--
9	--	--	--	--
10	--	--	--	--
11	--	--	--	--
12	--	--	--	--
13	--	--	--	--
14	--	--	--	--
15	--	--	--	--
16	--	--	--	--
17	--	--	--	--
18	--	--	--	--
19	--	--	--	--
20	--	--	--	--
21	--	--	--	--
22	--	--	--	--
23	--	--	--	--
24	--	--	--	--
25	--	--	--	--
26	--	--	--	--
27	--	--	--	--
28	--	--	--	--
29	--	--	--	--
30	--	--	--	--
31	--	--	--	--
32	.11388	.08306	.09891	.00460

TABLE 3 - DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR OF FINAL DELIVERY, 1967*

	PROGRAM	1**	2	3	4
1	Kindergarten	1.00000	--	--	--
2	G 1-3; Regular Pupils	--	1.00000	--	--
3	G 1-3; Physically Handicapped Pupils	--	--	1.00000	--
4	G 1-3; Educationally Handicapped Pupils	--	--	--	1.00000
5	G 4-6; Regular Pupils	--	--	--	--
6	G 4-6; Physically Handicapped Pupils	--	--	--	--
7	G 4-6; Educationally Handicapped Pupils	--	--	--	--
8	Education for Mentally Retarded Pupils	--	--	--	--
9	Community Activities	--	--	--	--
10	Instrumental Music	--	--	--	--
11	English as a Second Language	--	.01438	--	--
12	Learning Enrichment	--	.00344	--	--
13	Remedial Reading	--	.09784	--	--
14	Mentally Gifted	--	.00458	--	--
15	Learning Disability	--	.01042	--	--
16	Remedial Speech	--	.01484	--	--
17	Home Bound Pupils	--	.00126	--	--
18	Summer School; Regular Pupils	--	.02733	--	--
19	Summer School; Physically Handicapped	--	--	.03294	--
20	Summer School; Mentally Retarded Pupils	--	--	--	--
21	Summer School; Educationally Handicapped	--	--	--	.03267
22	Summer School; English as a Sec. Language	--	.00057	--	--
23	Summer School; Remedial Speech	--	.00035	--	--
24	Lunch	--	.05414	.01442	.01723
25	Guidance and Mental Health	--	.00697	--	.09667
26	Library	.03838	.01826	.00445	.00514
27	Pupil Health	.02988	.01303	.00347	.00400
28	Transportation	.02441	.01258	.28279	.09433
29	General Curriculum	.08905	.09344	.06157	.07076
30	Maintenance	.03362	.02896	.02692	.02452
31	Custodial and Other Operations	.09384	.08086	.07518	.06844
32	Administration	.11955	.12316	.12035	.12170

*Each entry shows, per dollar of final delivery by program named at top, the total dollar activity directly and undirectly required from program named at left. This is the inveral of an identify matrix less the matrix shown in Table 2. Source: Data are based on Table 2.

**Columns have the titles of rows of the same number.

TABLE 3 (CON'T.)

	5	6	7	8	9	10	11
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--
5	1.00000	--	--	--	--	--	--
6	--	1.00000	--	--	--	--	--
7	--	--	1.00000	--	--	--	--
8	--	--	--	1.00000	--	--	--
9	--	--	--	--	1.00000	--	--
10	.02158	--	--	--	--	1.00000	--
11	.01568	--	--	--	--	--	1.00000
12	.00750	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	.00499	--	--	--	--	--	--
15	.02246	--	--	--	--	--	--
16	.00809	--	--	--	--	--	--
17	.00137	--	--	--	--	--	--
18	.02980	--	--	--	--	--	--
19	--	.04868	--	--	--	--	--
20	--	--	--	.01925	--	--	--
21	--	--	.03262	--	--	--	--
22	.00062	--	--	--	--	--	--
23	.00019	--	--	--	--	--	--
24	.06149	.01422	.01647	.01625	--	--	--
25	.01016	--	.09648	.09522	--	--	--
26	.01897	.00451	.00513	--	--	--	--
27	.01477	.00352	.00399	.00387	--	--	--
28	.01525	.27849	.09412	.15926	--	--	.10344
29	.08969	.06188	.07062	.04752	--	.07184	.07417
30	.03166	.02722	.02440	.01925	.24864	.02074	.01327
31	.08839	.07596	.06811	.05372	.68435	.05789	.03702
32	.12148	.12056	.12135	.12252	.09758	.12316	.12450

TABLE 3 (CON'T.)

	12	13	14	15	16	17	18
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	1.00000	--	--	--	--	--	--
13	--	1.00000	--	--	--	--	--
14	--	--	1.00000	--	--	--	--
15	--	--	--	1.00000	--	--	--
16	--	--	--	--	1.00000	--	--
17	--	--	--	--	--	1.00000	--
18	--	--	--	--	--	--	1.00000
19	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--
25	--	--	1.00000	.23029	--	--	--
26	--	.01552	--	--	--	--	.03498
27	--	--	--	--	--	--	.02723
28	.12349	--	--	.05503	--	--	--
29	.06887	.10904	--	.06904	.09585	.28295	.15300
30	.01304	.00022	--	.00447	.00432	--	.04381
31	.03630	.00061	--	.01250	.01207	--	.12231
32	.11455	.12964	.12957	.12404	.12888	.12774	.11853

TABLE 3 (CON'T.)

	19	20	21	22	23	24	25
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	1.00000	--	--	--	--	--	--
20	--	1.00000	--	--	--	--	--
21	--	--	1.00000	--	--	--	--
22	--	--	--	1.00000	--	--	--
23	--	--	--	--	1.00000	--	--
24	--	--	--	--	--	1.00000	--
25	--	--	--	--	--	--	1.00000
26	.00758	--	.00983	--	--	--	--
27	.00606	.00939	.00786	--	--	--	--
28	--	--	--	.10462	--	--	--
29	.07446	.16244	.09657	.08786	.19373	--	--
30	.04195	.04612	.02746	.02747	--	.09635	--
31	.11738	.12707	.07644	.07579	.02464	.26897	--
32	.12443	.12204	.12566	.12440	.12699	.11864	.12957

TABLE 3 (CON'T.)

	26	27	28	29	30	31	32
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--
26	1.00000	--	--	--	--	--	--
27	--	1.00000	--	--	--	--	--
28	--	--	1.00000	--	--	--	--
29	--	--	--	1.00000	--	--	--
30	.01403	.01167	.02475	--	1.00000	--	--
31	.03920	.03256	.06912	--	--	1.00000	--
32	.06068	.12585	.11064	.11440	.08344	.09936	1.00462

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